

GUIDE-ASSISTED CAPTURE OF MATERIAL DATA

CROSS-REFERENCE TO RELATED APPLICATIONS

[0001] This application is a continuation of U.S. patent application Ser. No. 16/447,943, filed Jun. 20, 2019, issued as U.S. Pat. No. 10,872,426 on Dec. 22, 2020, which claims the benefit of U.S. patent application 62/687,741, filed Jun. 20, 2018. These applications are incorporated by reference along with all other references cited in this application.

BACKGROUND OF THE INVENTION

[0002] This invention relates to digital imaging technology and, more specifically, a process that uses a handheld device and a capture guide to capture data of sample materials used to construct products such as clothing, jewelry, or other products.

[0003] Designers, manufacturers, and others involved in product production get their inspiration for products when personally handling samples of materials. For example, a clothing designer may be presented with and inspired by a particular fabric they encounter in real-life, for use in creating a garment they are working on. However, it is often difficult for the designer to collaborate with others, since there is no way to easily capture and share information about the particular fabric.

[0004] One way to do so is by keeping actual physical samples of materials in a library. When a particular sample is needed, the sample is found and shipped. This makes it difficult for designers to work collaboratively, especially with those whom may be at different locations.

[0005] Further, while material manufacturers may provide basic information such as the color, pattern, and elements used to create a material, this information often lacks the specificity that a designer may need in the future to use a material in production. Since each manufacturer may also not adhere to the same nomenclature as other manufacturers to describe attributes of their materials, it is difficult for the designer to view, choose, and understand how different materials may look together or how they would work for a final product by using the manufacturer provided descriptions alone. For example, manufacturers may classify different blues differently than other manufactures or describe particular patterns differently.

[0006] Some designers work with photos of materials, taken using a flatbed scanner. However, flatbed scanners are not portable, and require the user to go to the scanner in order to capture data. A flatbed scanner also takes poor images of materials with texture, like pebbled leather, which limits its usefulness.

[0007] Therefore, there is a need to allow accurate and useful data collection about materials.

BRIEF SUMMARY OF THE INVENTION

[0008] In an implementation, a material data collection system allows capturing of material data. The material data collection system allows the conversion of real-world materials in a physical space, into a high-quality digital asset in the virtual space that may be searched, shared, and used by others. For example, the material data collection system may include digital image data for materials. The material may be any type of material whose information is to be stored in the

material data collection system, such as fabric, knits, weaves, skins or hides, vinyl, plastics, composites, textiles, cotton, flax, wool, ramie, silk, denim, nylon, polyester, or many other materials. The material data collection system may ensure that captured digital image data is properly aligned, so that material data may be easily recalled for later use, while maintaining the proper alignment for the captured digital image. The material data collection system may include using a capture guide, to provide cues on how to orient a mobile device used with the material data collection system. An application installed on the mobile device may offer additional options to properly orient digital image data captured by the mobile device. This may provide various benefits. For example, mobile devices may vary from other based on its model, manufacturer, defects found in its parts, or other factors. This may result in aberrations that may affect digital image data captured by the material data collection system, such as a camera lens defect that produces as a pin-cushion effect, a fisheye effect, or other types of aberrations. The material data collection system may transform digital image data, to remove or reduce these undesirable effects.

[0009] In another implementation, the material data collection system may assist a user to correctly hold or position a mobile device when capturing a digital image of a sample material. For example, before capturing the digital image, the mobile device may capture the orientation of a tabletop or other surface that the sample material is placed upon. When the digital image is being captured, the material data collection system may indicate to the user when the orientation of the camera is the same or similar to the orientation of the tabletop. The orientation of the camera is the same or similar to the orientation of the table top when, as measured by an accelerometer, gyroscope, or other similar device, the difference in the tilt, yaw, or roll of the camera and table top is less than a predefined limit (e.g., 1 degree, 2 degrees, 3 degrees, 5 degrees, or any other number of degrees).

[0010] In various embodiments, the material data collection system may include lighting information with a captured digital image. For example, one area of a material sample may be brighter than another, because of a light source that is casting light more on one area of the material sample than another. A capture guide included in a captured digital image may include one or more lighting calibration areas. Depending on differences between the one or more lighting calibration areas, the material data collection system may determine how the lighting in the captured digital image differs across the captured digital image. An example of a technique that may be used include histogram equalization or wavelength normalization.

[0011] The material data collection system may also allow users to save metadata with a captured digital image. For example, a user may want to note with a captured digital image a material name, code, orientation, and size. Instead of making notes on paper or using a separate computerized system, the user may enter this information into the material data collection system and the information is associated with the captured digital image and uploaded to a product life-cycle management system.

[0012] In an implementation, the material data collection system includes using an application executing on a mobile device to capture an initial material sample image. The initial material sample image may be a digital image that includes a sample material area and a capture guide area